ENTOMOLOGICAL
SOCIETY OF
BRITISH COLUMBIA

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF

BRITISH COLUMBIA

(INCORPORATED)

1925

NUMBER TWENTY-TWO

Printed by
Evans & Hastings, 576 Seymour Street, Vancouver, B. C.

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PROCEEDINGS
of the
ENTOMOLOGICAL SOCIETY
of
BRITISH COLUMBIA

The twenty-fourth annual meeting was held in the Blue Room, Hotel Vancouver, Vancouver, B. C., on the 14th February, 1925, with an average attendance of twenty-five.

The following papers were read:

Presidential Address - - - - -	L. E. Marmont
Pansy spot on apples - - - -	E. P. Venables
Lace bugs of B. C. - - - -	W. Downes
Insect relations and actions - - -	G. J. Spencer
Some insect galls of B. C. - - -	Miss Davidson
Birds and Insects - - - - -	W. B. Anderson
Why plant quarantine? - - -	W. H. Lyne
Some insect problems in Vancouver -	R. Glendenning
The rose scale - - - - -	W. Downes

The following motions were passed:

That Messrs. Downes and Hardy be appointed to compile a catalogue of Society's library.

That back numbers of our proceedings be charged for at the following rates.

Complete sets (as far as possible)	$10.00
Single copies	.50
Single copies to members	.25
Current numbers to members	free

A letter was read from Mr. Venables suggesting that the next annual meeting should be held in Vernon, synchronizing with the meetings of the B. C. Fruit Growers' Association. It was deemed inadvisable to remove the venue of the annual meeting from the coast, but the suggestion was made to Mr. Venables that a supplementary meeting be organized at that time.

The following new members were elected:

G. A. Hardy, J. Hincke, P. W. McLeod, G. J. Spencer.

The election of officers resulted as follows:

Hon. President ..... F. Kermode
President ..... L. E. Marmont
Vice-President (Coast) ..... G. J. Spencer
Vice-President (Interior) ..... E. P. Venables
Advisory Board:
Messrs. Bannister, Downes, Hardy, Lyne, and Whittaker.
Hon. Secretary-Treasurer ..... R. Glendenning
Hon. Auditor ..... J. W. Eastham

REPORT OF THE SECRETARY-TREASURER FOR THE YEAR 1924

I beg to submit the following report on the activities of the Society for the past year:

Finances

The financial state of the Society continues good, the cash balance to date being $176.55, which compares favourably with that of 1923, which was $133.75. Our expenditure for the year has been $280.10 and our income $322.90. We received the Provincial Government Grant of $250, as usual.

Proceedings

Number 21 of our proceedings was published in October at a cost of $205.

Requests for this number and other back numbers has been exceptionally heavy this year and has taken up much time and a considerable sum in postages.

Two complete sets were sold to a dealer in New York for $13.25.

With this exception, all requests are sent free, but institutions are always asked to place us on their mailing lists, and I am glad to say that several have done so, including the U. S. Bureau of Entomology.

Membership

The membership remains practically stationery around thirty. One or two have dropped out, but their places have been filled.

Our greatest loss during the year was the sad death of Mr. Treherne, who did so much for our Society. At the President's suggestion a short obituary notice was included in our Proceedings No. 21. A letter of condolence was also sent to Mrs. Treherne.

I have pleasure in announcing the inclusion in our ranks of Prof. G. J. Spencer, of the University of B. C.; an entomologist who will be very welcome.

FINANCIAL STATEMENT FOR THE YEAR 1924

Receipts		Expenditures	
Balance from 1923	$133.75	Printing programmes	$ 10.34
Subscriptions	54.00	Postages	26.47
Govt. Grant	250.00	Printing proceedings	205.00
Bank Interest	5.65	Dues to Ont. Society	32.25
Sale of Proceedings	13.25	Sundries	6.04
		Balance in bank	176.55
	$456.65		$456.65

R. GLENDENNING
Hon. Secretary-Treasurer.

Audited and found correct,
J. W. EASTHAM, Auditor.

PRESIDENTIAL ADDRESS

BY L. E. MARMONT

TO THE MEMBERS OF THE BRITISH COLUMBIA ENTOMOLOGICAL SOCIETY:
LADIES AND GENTLEMEN,

It is with much pleasure that I cordially welcome you to the 24th annual meeting of our Society.

I am glad to say that our membership has been well maintained, and I understand from the Secretary-Treasurer that financially we are in our usual good shape.

During the past year, and since our last annual meeting, as you all know, the hand of death has once more fallen on the Society, this time on one of our best loved and most valuable members in the person of Mr. R. C. Treherne, known affectionately to most of us as "Tre." His untimely death on June 7th last came as a sudden and painful shock, and, like a bolt from a blue sky, a most promising career cut off in its very prime. We shall all miss his cheery presence, for although removed from our midst to Ottawa in 1921 to assume important duties in the Entomological department there, he still remained one of our most active members, and we know that his heart was in B. C. We all looked forward to his return among us at some future time.

It will be most fitting that at this first annual meeting since his passing a sincere vote of condolence should be forwarded to his sorrowing relatives.

I have just been looking at a photographic group of the members present at the 1913 annual meeting (there are 18 in the group), and I was struck by the fact that of these no fewer than five have passed over to the great majority, while of the others some have gone elsewhere, and of the 18 only four now remain on our membership list—Messrs. Day, Blackmore, Lyne and Prof. Davidson. Five are seated at the table, and only Dr. Hadwen survives of these.

We have once more succeeded in obtaining the usual grant from the Provincial Government, not, however, without the annual opposition from one or two members of the House, who, apparently, like to make this an occasion for alledgedly humorous remarks about Entomologists in general. One member in particular described that individual as a person who went about with a butterfly net and a pair of green spectacles to pounce upon butterflies and bugs to impale upon pins. He did, however, admit (and I give him full credit for generosity) that since the previous year he had discovered that the green-spectacled gentleman very considerately put them out of their misery painlessly with some sort of preparation, or, to use his own words, "some kind of dope." I think this gentleman must wear heavily smoked glasses himself.

From a collectors point, especially as regards Lepidoptera, the season of 1924 was possibly the worst experienced for many years. Many of the species which are usually more or less abundant were entirely absent; in spite of this, however, a few records new to the Province were made, while here and there some rare species were captured. The scarcity of Noctuid moths, however, has its good point, viz., the probable diminution of cut-worm injury.

Some new outbreaks of insect pests have occurred, notably in regard to scale insects; these, I understand, will be made the subject of papers to be read at this meeting, and I feel sure they will contain much information of value with reference to methods of attack and control of these unwelcome immigrants. Herein lies the great value to the community of such a society as ours, and I was pleased to note that this was made a good point of by the Minister of Agriculture when the subject of the annual grant was under discussion.

We are still very much behind the times in the matter of check lists of the various orders of insects of B. C., although some of our members have been quietly working along these lines, but it takes money, as well as hard work, to get them out and up to date, and unfortunately few can afford the expense.

I am sorry to find that there is again an absence of any papers from

some of our well known older members, whose contributions I am sure would be most welcome at the annual gathering, and I sincerely hope they may favor us with some notes or observations for our next meeting.

Most of us remember the papers which always used to be read at the annual meetings of the Parent Society from the pen of the late Dr. T. Fyles, with their pleasant conversational features recording his field notes each season. A few papers like these would do much to popularize the study of Entomology, and this is something much to be desired if we are to continue and flourish as a society. I have in mind an old friend of mine in Manitoba who began with a cigar box collection and who is now an active and valuable economic entomologist in the service of the Dominion. Our dear old friend Dr. Fletcher always made a point of encouraging and assisting the boy or girl collector who wished any information about the insects they captured.

The various members who specialize in the different orders are continuing their work and adding to our knowledge of the insect fauna of the Province. To mention a few, there are: Mr. Blackmore (Micro Lepidoptera); Mr. R. S. Sherman (Diptera); Mr. Downes (Hemiptera); Mr. Glendenning and Miss McDougall (Aphididae); Mr. Buckell (Orthoptera); etc., besides several general collectors.

I do not wish to trespass any longer on your time with these more or less disjointed remarks. You will have much more valuable information to listen to in the various papers to be read, and I will therefore conclude by wishing you all the utmost prosperity during 1925, and expressing the hope that our discussions at this session may prove of much value to the members of the B. C. Entomological Society, and also to the Province as a whole.

PANSY SPOTS ON APPLES

(A Peculiar Form of Thrips Injury.)

BY E. P. VENABLES

DOMINION ENTOMOLOGICAL BRANCH, VERNON, B. C.

The attention of those engaged in the production of apples in the North-Western United States, and also in British Columbia, is frequently attracted to certain peculiar yellowish-white blotches upon the skin of the fruit, each blotch bearing in its centre a distinc dark puncture. It is not uncommon to find as many as fifteen or more of these blemishes upon a single fruit. The term Pansy Spot has been applied to this trouble on account of the similarity in appearance of many of the spots to the bloom of a pansy.

A considerable amount of culling may take place when these spots are numerous, although it has not been demonstrated that any actual injury is caused to the underlying tissues beneath the spots, which are confined to the extremely thin outer skin of the fruit.

The cause of this trouble was in doubt up to the year 1921, various insects being held responsible. Leaf-hoppers, aphids, and various plant bugs had been under suspicion, but no definite evidence incriminating any one class of insect had been forthcoming. In that year Mr. E. J. Newcomer, of the United States Bureau of Entomology, was successful in showing that thrips were evidently the cause of Pansy Spot. Mr. Newcomer's findings were set forth in an article in the October number of "Better Fruit," 1921, under the title "A Thrips Injury to Apples," and therein is contained the first correct diagnosis of the trouble, based upon the finding of thrips eggs within the central punctures of spots upon apples.

From observations made by the writer in 1920 and 1921, at the instance of the late Mr. R. C. Treherne, at that time in immediate charge of entomological work in British Columbia, it was inferred that the primary injury causing the spotting of the fruit took place at some time prior to the closing of the calyx, and possibly before the petals had fallen. This supposition was supported by the facts that many young fruits showed typical spotting at the time that the petals were falling, and that both adult and larval thrips were present within the calyx at that time, their presence indicating that eggs had been deposited within the flower parts, and upon developing apples.

In 1922 and 1923, careful observations of both blossoms and fruit resulted in the finding of undoubted thrips eggs, both in the pistils of the blossom and in many of the spots upon the apples. The eggs appear as minute, kidney-shaped objects of a translucent appearance. The presence of eggs within the pistils is usually indicated by small, dark brown punctures upon the surface of the style; the eggs are quite difficult to locate when placed in this position. Eggs deposited in the skin of the apples lie in small cavities, with the end of the eggs flush with the surface. As development progresses, the eggs swell up, and the red eyes of the larvae are clearly visible within.

After the eggs have hatched, there is a well-defined but minute slit in the skin of the fruit, marking the position occupied by the egg; this puncture gradually heals over, leaving a small, dark point, surrounded by a yellowish-white spot.

In order to secure definite evidence as to the class of insect concerned with this type of injury, a number of blooms, the styles of which showed typical egg scars, were selected. The petals and stamens were cut off, leaving the pistil and fruit intact, the stalk being thrust into a cork which

was inserted in a vial. This arrangement held the fruit clear of the glass and allowed of easy examination. Fruits isolated in this manner produced from 1 to 6 larvae each between May 23 and May 30.

In another series of experiments, young apples, showing typical spotting, were isolated in the same manner. These had all the flower parts removed, leaving the fruit itself as the only source from which larvae could emerge. From these, larval thrips were secured between June 6 and 15. Unfortunately none of these larvae were bred through to adults.

In 1922 the first larvae were found within the calyx of crab apples on May 20, the trees being then in full bloom. On May 22 larvae were found commonly, and varied in numbers from one to as many as six or eight individuals within a single calyx. The calyx cavity apparently offers an ideal condition for feeding and concealment during the early development of the insect. No eggs have been noted within the stamens, although these organs show evidence of feeding by the thrips.

As soon as the petals fall, and the essential organs commence to dry, the thrips abandon the calyx and migrate to the nearby flowering weeds and leguminous plants. A few individuals may be found during the summer within the tender, unfolding leaves of the terminal growth of apple trees. The insects swarm upon tumbling mustard, during early June, and eggs occur within the blossom stalks of this plant. Alfalfa plants harbour numbers of thrips during the whole summer, and reproduction is known to take place upon this plant.

Thrips occur, also, within the blooms of plums and prunes, although no definite injury has been noted to this class of fruit.

The spotting of the fruit produced by thrips' oviposition will persist in certain varieties of apples until picking time, and it is usually at this period that the attention of the grower is first called to the trouble. The persistence of the spots upon the fruit varies with different varieties, many of which, such as crabs and Wageners, which may harbour numbers of thrips during the blooming period, and which will show numbers of blemishes in the early summer, practically outgrow the injury by the autumn. On the other hand, some of the leading varieties, including McIntosh Red and Northern Spy, are particularly susceptible.

Typical Pansy Spot also occurs upon grapes and tomatoes, the spots being identical in appearance to those found upon apples. Extensive collections of thrips taken from apple bloom have shown that **Frankliniella occidentalis Prg.** is by far the most prevalent species, and there can be but little doubt that this insect is responsible for the injury commonly termed Pansy Spot. The species also represent the bulk of our collections from plants growing throughout the orchards. Both **Aeolothrips fasciatus Ling.** and **Aelothrips conjunctus Prg.** have been taken from

apple bloom. An unidentified species of **Taeniothrips,** possibly **T. vulgatissimus,** also occurs, but to a lesser degree. It is probable that these species have no connection with the fruit injury. In fact, according to the late Mr. R. C. Treherne, to whom I am indebted for the identification of the species mentioned, they are doubtless predacious upon **Frankliniella occidentalis Prg.**

Frankliniella occidentalis is undoubtedly a species of considerable economic importance. The insect has been shown by Mr. H. L. Seamans, of the Dominion Entomological Branch, to cause heavy losses in those areas of Alberta specializing in alfalfa seed production. In an article he published in The Canadian Entomologist, May, 1923, he states that as many as seven generations may be produced in a single season upon alfalfa.

The growing of alfalfa as an orchard cover crop in certain sections of the dry belt of British Columbia may have some bearing upon the prevalence of Pansy Spot in those sections. The late Mr. Treherne, during his residence in the Province, drew attention to the possibility of thrips being active agents in the dissemination of fire blight during the blossoming period. The preference shown by these insects in ovipositing and feeding within the blooms has undoubtedly a direct bearing upon this question. Control measures have not as yet been deemed necessary, but where McIntosh, Northern Spy and perhaps Jonathans are grown, they may be considered advisable. Standard thrip sprays applied during the pink stage would undoubtedly help to reduce the injury.

LACE BUGS OF BRITISH COLUMBIA

By W. Downes

To the casual observer the members of the order Hemiptera, or bugs, possess no especial attraction. They are associated in the mind with the flat-bodied evil-smelling creatures that not infrequently infest ill-kept hostelries and tenements, or with the large Pentatomids or stink bugs whose nauseating odour left behind by them on raspberries and blackberries is familiar to us at fruit picking time. And even some naturalists, unless they be also entomologists, are unaware of the variety of strange and beautiful forms possessed by this order of insects, the majority of which, like those that are the subject of this paper, are far removed in appearance from their cousins of malodorous notoriety.

The members of the family of Lace Bugs or Tingidae are among the most unique and beautiful of our insect fauna. They are easily recognized by their gauze-like, reticulated wings, the peculiar hood over the head and the broad lateral expansion of the prothorax, suggestive of an

exaggerated Elizabethan collar. They are small, feeble creatures, occuring in large numbers on the under sides of the leaves of various trees and shrubs, and are frequently of considerable economic importance. Lace bugs possess no ocelli; the beak and antennae are four-jointed; the scutellum is absent or rudimentary, but is replaced by the angular hind portion of the pronotum; the tarsi are two-jointed. Unlike other heteroptera, they possess no objectionable smell and may be handled with impunity.

The eggs are usually laid on the under sides of leaves along the sides of some prominent vein usually more or less inserted into the substance of the leaf. They are covered with a dark sticky substance which encases them completely, hardening soon after oviposition. It adheres so firmly to the eggs that it is impossible to remove it without crushing them. The eggs thus covered bear a much greater resemblance to certain young homopterous galls or to some forms of fungi than they do to eggs of any sort.

The young nymphs are usually brownish in colour and of most bizarre appearance in keeping with the peculiarities of the other life stages. All parts of their bodies are armed with clusters of spines, causing them to resemble lobes of prickly cactus. They congregate together in large numbers, and their feeding activities give rise to a mottling of the upper surface of the leaves, which later may turn brown and drop off. They usually hibernate in the adult stage among dead leaves and under bark. Many of the species are confined to one food plant, others again are known to occur on several, but on the whole the range of trees, shrubs and plants affected by lace bugs is a restricted one. Twelve species are at present known to inhabit our territory. Nine of these belong to the genus **Corythuca**, the other three genera having only one representative each.

The peculiar structure of Lace Bugs involves the use of certain special terms. The globular forward extension of the pronotum entirely covering the head is called the hood. This may be large and rounded at the posterior end, as in the genus **Corythuca**, but in some other genera it is absent, or so small as to be scarcely appreciable. The expanded lateral appendages of the pronotum are termed the paranota. The "angulate process" is the posterior extension of the pronotum; this bears three longitudinal carinae, in some genera reduced to mere ridges. The hemielytra in some genera are raised sharply near the anterior inner margin, forming the "discal elevation." The reticula, or spaces enclosed by the nervures of the pronotum and hemielytra, are termed areoles.

Genus **Acalypta** Westwood

Small oval species, the hood very small, covering the base of the head; the vertex with two short divergent spines; eyes coarsely granulated; first segment of the antennae swollen; the second smaller; the

third long and slender; the fourth fusiform. The pronotum with three carinae; the margins of the pronotum and hemielytra narrow, the latter with one complete series of areoles and in certain species a partial second. Species dimorphic.

Acalypta modesta Parshley is the only species of this genus known to be found in British Columbia. It was first described by Parshley (Proc. B. C. Ent. Soc., 1921, p. 16) from three specimens collected by the late R. C. Treherne at Royal Oak. These specimens, the only ones so far collected, were found by him under moss on rocks on May 14th, 1917. These specimens were all brachypterous. The exact location was at the back of some houses overlooking the new cemetery at Royal Oak.

Genus **Corythuca** Stal

Hood large, entirely covering the head, usually constricted at the middle, the posterior portion globose; paranota large, more or less reniform, extended forwards, armed on the outer margins with short spines; hemielytra gauze-like, strongly constricted at the base, with a tumid elevation near the antero-inner margin; costal margins, nervures of hood and hemielytra usually more or less furnished with spines.

Key to British Columbia species of Corythuca

1. Hood usually twice or more as high as median carina.....2
   Hood less than twice as high as median carina.....7

2. Species large, 4 mm. long.....3
   Species smaller 4

3. Lateral carinae terminating near base of hood; hood entirely brown, not very abruptly constricted; costal margins of hemielytra convex; apical band on hemielytra enclosing several hyaline areoles.....**distincta.**
   Lateral carinae not terminating near base of hood; hood abruptly constricted; costal margins of hemielytra straight, parallel; apical band wide, enclosing a few areoles with hyaline centres.....**padi.**

4. Hood less constricted; costal margins of hemielytra nearly straight and parallel; apical band wide and almost entirely dark; length 3 mm. .....**hewitti.**
   Species spotted light brown, the markings united at apex to form two irregular bands..... 5

5. Species small, 2.3 mm. long; markings sometimes pale or obsolete; costal margins of hemielytra concave.....**morilli.**
   (a) Species larger, 3 mm. or over, hemielytra long, the discal elevations not extending to middle.....**marmorata.**
   (b) Hemielytra short, the discal elevations tumid, extending to middle.....**marmorata var. informis.**

6. Hemielytra with oblique smoky band near apex, sometimes faint or obsolete; nervures yellowish; discal elevations small, sharp **salicata.**
   Hemielytra with irregular apical band not so oblique, milk white areoles and nervures contrasting with dark markings; discal elevations larger ..... **salicis.**
7. Species immaculate or faintly marked; base of hood flattened; lateral carinae terminating near base of hood..... **immaculata.**

Corythuca distincta Osborn and Drake. This species was found infesting hollyhocks at Vernon. It is a strongly marked species. The hood is almost entirely brown. There are two prominent brown spots on the paranota, a brown patch at the base of the hemielytra and an apical band interrupted with several hyaline areoles, causing it to appear as a somewhat oblique marking to the unaided eye. There is usually a small brown spot at the centre of the costal margin of the hemielytra. There is a brown patch on the discal elevation, and the nervures of the paranota and hemielytra are more or less embrowned. The anterior margins of the paranota are furnished with six or seven recurving spines.

Corythuca salicis Osborn and Drake. Among our British Columbia species this is readily recognized by the milk-white areoles of the paranota and elytra causing the dark brown markings to stand out very distinctly. This very pretty species was found abundant on **Salix hookeriana** at Mission. The hood is whitish with the nervures more or less embrowned. Paranota white with a brown patch on the anterior portion and usually a trace of a second spot on the posterior portion. Elytra whitish hyaline with brown patches at the base and apex on the costal half. The discal elevations are more or less embrowned. Length 3.5 mm., width 2 mm. This species was described as new by Parshley under the name **canadensis** (Univ. Mich. Occas. Pap. 71, p. 18.)

Corythuca hewitti Drake. Taken at Vernon on hazel **(Corylus californica).** The species occurs also in Manitoba and was described by Drake from specimens taken there (Can. Ent. L 1, p. 159). It was redescribed by Parshley as new under the name **hesperia.** (Loc. Cit.) This description is quoted here in part. "Membranous portions hyaline,..... disc of pronotum brown; dorsal veinlets of hood brown; paranota immaculate or with a faint brownish spot before middle; median carina with a brown spot; lateral carinae and apex of angulate process white; hemielytra with broad and distinct apical and basal brown bands, without included clear areoles; the extreme apical row of areoles hyaline. Antennae, legs and plates forming rostral, groove light yellow. Body piceous."

Both Parshley's and Drake's descriptions speak of the spot on the paranota as "small" or "faint," but in the long series of British Columbia material before me it is usually large and distinct. Length 3.05 mm., width 1.08 mm.

Corythuca padi Drake. This is a common species, occurring both in

the interior and at the coast. I have taken it at Vernon on hazel, crataegus, alder, birch and chokecherry, at Goldstream, near Victoria, on hazel and alder, and at Agassiz on hazel and Japanese Walnut. In the arrangement of the colour pattern it resembles the preceding species, but is easily distinguished from it by its larger size, the height and shape of the hood, which is much darker, proportionately smaller and fewer spines, and partially hyaline areoles enclosed by the apical band on the hemielytra. There is one conspicuous spot on the paranota and often a second smaller one. In general the species is heavily marked and easy to recognize among our British Columbia forms. Length 4 mm., width 2.4 mm.

Corythuca salicata Gibson. This is our commonest species and occurs nearly everywhere. The food plants include willow **(Salix scouleriana** and **S. lasiandra),** cottonwood, alder and apple. The markings vary greatly in distinctness and are liable to be much fainter in hibernated than in fresh specimens. The general aspect is dirty white tinted brownish in places. The principal marking is the apical band, which is small and oblique, and in many specimens does not extend beyond the costal area. The hood is not much higher than the median carina, and the borders of the paranota and hemielytra have a very few small spines. Length 3.4 mm., width 2 mm.

Corythuca marmorata Uhler. A few specimens are at hand from Vernon. General aspect yellowish white, the paranota white with a brown spot at the middle. Veinlets of hood embrowned; discal elevations embrowned; a brown spot at the base of the hemielytra and another in the middle of the costal area; the apical band pale brown, broad, enclosing several hyaline areoles. The entire margins of the paranota are bordered with short spines and also the basal half of costal margins of the hemielytra. In the eastern states it is said to feed on various species of the genus aster. Length 3.2 mm., width 1.8 mm.

Corythuca marmorata var. **informis** Parshley. This variety was described from examples taken at Vernon. It is much smaller than the typical form and the abbreviated hemielytra, and their peculiar exaggerated discal elevations will, in a general way, make it easy to recognize, but there are intermediate forms which lead through to typical **marmorata.** Besides the Vernon specimens, I have taken this variety at Penticton on cottonwood. Length 3 mm., width 1.9 mm.

Corythuca morilli, Osborn and Drake. This is the smallest species in our list. So far it has only been taken at Penticton, where I found it abundant on **Artemisia dracunculoides** in a very bare and unpromising-looking gulch to the west of the town. The markings of this species in their general arrangement resemble those of **marmorata,** but are less distinct, some individuals being almost immaculate. The pronotal hood is noticeably high, its height being twice that of the median carina and about two-thirds its own length. The hood is more or less embrowned,

and there is a large spot in the middle of the paranota. A spot at the base of hemielytra in the costal area and another midway between that and the apical band. The latter is irregular and sometimes faint and encloses four or five large hyaline areoles. The discal elevations are also more or less embrowned. Length 2.3 mm., width 1.2 mm.

Corythuca immaculata Osborn and Drake. This species is common on **Balsamorhiza sagittata** Nutt. throughout the dry belt. Specimens are at hand from Chilcotin, Vernon, Westbank and Summerland. Many individuals, particularly hibernated ones, are pure milky white without any markings whatsoever, but fresh specimens taken in the middle of summer exhibit pale brown markings of varying distinctness at the base and apex of the hemielytra and on the discal elevations. Length 4.1 mm., width 2.5 mm.

Genus **Leptobyrsa** Stal.

Pronotal hood much smaller than in Corythuca, oval, not globose, narrowing at the top to a central ridge; lateral carinae short and feebly raised; the median carina long and as high as the crest of the hood; hemielytra twice as long as abdomen, strongly rounded from base to apex, widest behind the middle; nervures with very fine long hairs.

Leptobyrsa rhododendri Horvath. This introduced species was discovered in B. C. in 1924 infesting rhododendrons in a nursery near Victoria. As it appears to have been established there for more than one season, it has probably by this time been distributed to other points in British Columbia. The species is native to the eastern United States, from whence it was introduced to Europe. It has been recorded from Great Britain, France, Holland, Switzerland and Japan. Its host plants include **Kalmia latifolia** and Rhododendrons, to which it can do serious damage when numerous. Infested leaves take on a mottled appearance from the destruction of the chlorophyll and later may turn brown and leathery and cease to grow.

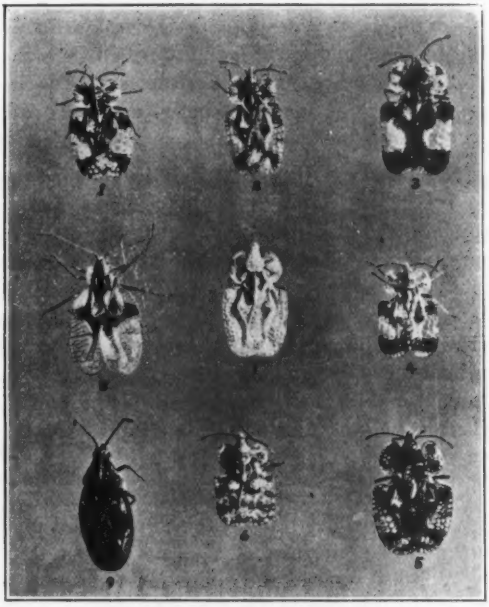
The adults of this species do not hibernate, the winter being passed in the egg stage. The eggs are laid on the under sides of the leaves and are inserted within the epidermis of the midribs in late summer and early fall. The nymphs emerge the following May and June, and the adults appear towards the end of June and beginning of July.

This species will be readily recognized by its ample wings, which are twice as long as the body and rather broad. They are transparent and without markings, except a small clouded area near the base, and in some individuals a faint mark across the middle. Antennae long. The paranota are proportionately smaller than in the preceding genus and the hood is more oval, not constricted, narrowing to a central ridge. The nervures of the hood, paranota and wings are closely set with long, fine hairs. The antennae, legs and nervures are yellowish; the pronotum is brown; the body black. Length 3.9 mm., width 2 mm.

Genus **Physatocheila** Fieber

Physatocheila variegata Parshley. Specimens have been taken by Mr. Whittaker at Chilliwack on alder, and by myself at Mission on **Salix lasiandra.** It is also recorded from Vernon. In these insects the paranota are reflexed closely against the dorsal surface of the pronotum. In shape they are elongate oval. The reticulations of the hemielytra and pronotum are very close, but those of the costal area are larger and may consist of two to three confused rows of areoles, forming a narrow border, nearly even in width for most of its length, depressed below the remainder of the hemielytra. The upper surface is variegated with dull white and shades of brown, with the pronotum antennae and legs reddish. The species does not appear to be common in B. C., and only a few specimens have been taken. Length 3.5 mm., width 1.45 mm.

LACE BUGS OF BRITISH COLUMBIA



DESCRIPTION OF PLATE

Plate all figures x5

Fig. 1. **Corythuca salicis** Osborn and Drake
Fig. 2. **Corythuca salicata** Gibson
Fig. 3. **Corythuca padi Drake**
Fig. 4. **Corythuca hewitti** Drake
Fig. 5. **Corythuca distincta** Osborn and Drake
Fig. 6. **Corythuca marmorata** Uhler
Fig. 7. **Corythuca immaculata** Osborn and Drake
Fig. 8. **Leptobyrsa rhododendri** Horvath
Fig. 9. **Physatocheila variegata** Parshley

Corrections to article on New Records of Hemiptera from British Columbia, B. C. Ent. Proceedings, 1924.

Page 28—After line 12 insert Family **Coreidae.** After line 13 insert Family **Aradidae.** After line 15 insert Family **Lygaeidae.**

Line 28, for var. **pilosa** Fieb. read **vagabundus** var. **vagabundus** (Linnaeus). According to McAtee and Malloch (Proc. U. S. Nat. Mus. Vol. 67, p. 18), both this and the next species in the list must be referred to the genus **Empicoris** Wolff. **P. hirtipes** Banks, according to the same authority, is **Empicoris vagabundus** var. **pilosus** (Fieber).

Line 34, **Ploiariola californica** Banks should be changed to **Empicoris rubromaculatus** (Blackburn).

Page 29—line 28, for **distinguendas** read **distinguendus.** For Barkervelle read Barkerville.

WHY PLANT QUARANTINE

BY W. H. LYNE

Plant quarantine originated from the desire to foster and protect the production of certain plant food products and was gradually extended to include any products of economic importance threatened by serious insect pests or disease.

The foregoing synopsis is generally understood by those associated with the subject, but it may be interesting to sum up a few of the details that have been responsible for the advanced stages of the work.

Though quarantine dates back to the days of Adam and Eve, it is only in comparatively recent years that it has developed to a world-wide systematic procedure.

The new provinces or countries appear to have made the most rapid progress in adopting plant quarantine rules and regulations. This may be accounted for by the pioneers acting on their experience with conditions in the older countries from which they came. It became their ambition to keep the new country as free as possible from the destructive pests and diseases with which they were familiar.

The policy of the new countries seems to have stimulated some of the older ones to increase their vigilance in the matter of plant protection as noted by their new or amended regulations.

To-day practically every civilized country has some restriction or other with a view to protecting itself against a particular plant pest. In fact some of them appear to have become so keen on the subject as to seriously embarras certain commercial interests. But in spite of that

we have to admit the situation warranted action that would at least reduce the danger, even though it did not result in complete control. The fault has usually been in the methods adopted.

The methods commonly in operation are systematic inspection, disinfection and total embargo. The latter and most drastic of the three appears to have caused the greatest embarrassment. Unfortunately there are certain pests so obscure in connection with their particular host plant or product as to practically defy detection, and total embargo seems to be the only way to prevent their becoming established in the country or province trying to keep them out.

The question is sometimes asked, "Is not fumigation an effective safeguard?" and we have to reply that it is only effective with certain pests. If it were the all-efficient remedy some people imagine, our problem to avoid embargoes would be easier to solve. In many cases the fumigation formula could be made effective so far as the pest was concerned, but it would be disastrous to the product also.

A great deal has been accomplished in B. C. by rigid inspection, combined with fumigation, but it has not been absolutely successful. It would be very risky in dealing with certain pests, such as Potato tuber moth, Mediterranean fruit-fly, Potato canker, or Chestnut bark disease, etc.

The Entomologist and Pathologist, both economic and systematic, have done excellent work towards solving plant quarantine problems, but there is still a great deal more to be accomplished. Further research regarding minute details in connection with insect pests and diseases is necessary if our plant quarantine work is to be successful in aiding our producers to compete with commercial standards and retain the patronage of foreign markets.

The technical man who can devise means by which total embargoes can be safely removed, and increase the efficiency of control methods, has a bright future ahead of him.

Modern transportation is rapidly welding together the commercial enterprise of the several countries of the world, and, as population increases, the need for conservation of the earth's products will increase. Under those circumstances the work that plant quarantine is trying to accomplish now will be much more necessary in years to come.

Nature will reward the human race just to the extent that the human race assists her to do so. If, on the other hand, we leave everything for Nature to do, she will allow us to rot and be eaten up by pest and disease as the result of our negligence.

The young entomologist and pathologist just budding out should realize he has a man's work to tackle, and that his future efforts will contribute very largely to the preservation of generations to come.

THE LECANIUM SCALE OUTBREAK IN VANCOUVER, B. C.

BY R. GLENDENNING
DOMINION ENTOMOLOGICAL LABORATORY, AGASSIZ, B. C.

Summary of the Outbreak

In the late summer of 1923 the attention of the Dominion Entomological Branch was directed by the Superintendent of Parks, for Vancouver, Mr. W. S. Rawlings, to important injury to maple trees in Stanley Park. The trees were very unsightly, the leaves being shrivelled and were dropping prematurely. Examination showed this condition to be due to a very severe attack of a scale insect.

Stanley Park is one of the finest natural parks in North America; its great charm lying in the luxurious growth of coniferous and deciduous trees, of which maples constitute a large part.

It was seen that immediate steps would be necessary if the charm of this mecca of tourists and residents alike, was to be saved.

In the spring of 1924 certain of the worst infested areas in the Park were sprayed with a proprietory oil emulsion as an experiment, with satisfactory results.

During the following summer the city authorities received numerous complaints from several parts of the city regarding the state of the shade trees along the boulevards. These complaints were caused by the copious sticky exudation from the maturing females which dropped on pedestrians and covered the sidewalks.

At the request of the city authorities the whole area was scouted in the fall of 1924, and it was found that practically the whole of the boulevard trees in the west end of the city, lining some twenty-five miles of roadways, were badly infested with the scale.

On the recommendation of the Dominion Entomological Branch, the city purchased a powerful solid stream spray machine, and in the fall of 1924 and spring of 1925 some 3000 boulevard trees along the streets of Vancouver, and about five miles of roadside trees in Stanley Park, were treated with an oil emulsion spray.

The result of this work was most satisfactory, and although the pest has not been exterminated, the situation was greatly relieved, and it will not be necessary to spray so large an area in 1926.

Appearance and Life History Notes

This insect passes the winter in an immature stage on the twigs and smaller branches of its host. In this wintering condition it is a small, flat, oval-shaped object, 1.5 mm. long by .75 mm. broad, and pale brown

LECANIUM CAPREA L.

A. Immature scales hibernating on Maple twig.
(Original)

B. Condition in March.
I. Adult females of previous season (dead).
II. Young male scales.
III. Young female scales.
(Original)

in colour. The sexes at this time cannot be separated macroscopically. These young scales gradually increase in size during March, and early in April the male scales reach their full size and may be distinguished from the females by their greyish appearance.

The females remain brown and swell with great rapidity during April till they are the size of a pea. They are fully grown by the second week in May and are then greenish brown in colour.

The males emerge from their pseudo-pupal stage at this time and fly freely, mating with the sedentary females. These males are dark brown fragile insects, 1.5 mm. long in body, with an alar expanse of 4 mm. They are very much more numerous than the females, the proportion of the sexes being about 3 to 1.

After mating has taken place, the males die and the females turn chocolate brown, the eggs as they mature filling the whole of the body cavity under the scale. During June the maturing females secrete a copious sticky exudation and then die. This exudation ordinarily is the sole means of dispersal by causing the dead egg-filled body of the female to adhere to the feet of perching birds, which then carry them to other trees.

The eggs hatch during late June, July and August, and the young scales, pale brown in colour and measuring .3 by .5 mm., crawl freely to the underside of the leaves of their host, feeding there until the leaves begin to turn in September. They then migrate to the twigs, young branches, and tender places on the trunks, such as new cambium growth caused by an injury. They then ensconce themselves for the winter and, except in the case of the males when they fly, they do not again change their position during life.

Identity of the Species and Mode of Introduction

The species under discussion somewhat resembles **Pulvinaria innumerabilis,** for which it was at first mistaken, but it has not the cottony exudation of that species.

Specimens sent to the Dominion Entomologist, Ottawa, for determination were submitted by him to the Imperial Bureau of Entomology, and, through the kindness of the Director of the Bureau, were identified as **Lecanium capreae L.** by Mr. F. Laing.

Mr. G. F. Ferris has some notes and drawings of this species in the Canadian Entomologist for September, 1925, and which he states is now considered synonymous with **L. coryli L.**

We have no positive information as to the date or mode of introduction into British Columbia, but in 1903 a large shipment of shade trees arrived in Vancouver from England, and a scale, presumably the same,

LECANIUM CAPREAE L.

C. Adult females on pear.
(Original)

D. Winged male. 8X.
(Original)

was noticed on them a year or two later. By 1910 increased abundance led to efforts being made to stamp it out, and although a large number of trees were destroyed, the insect had by that time become firmly established on the native maples in Stanley Park and elsewhere.

Host Plants and Economic Importance

This species has a remarkable number and variety of hosts. It occurs most abundantly on horse-chestnut, broad-leaved maple **(Acer macrophyllum)** and vine maple **(Acer circinatum)**.

It also freely infests common laurel **(Cerasus laurocerasus)**, English hawthorn **(Crataegus oxyacantha**, and vars.), and rose bushes.

Other hosts of lesser importance are alder, elm, birch and the several species, of **Pyrus, Prunus, Tilia, Ribes** and **Rubus**, including the native salmonberry and thimble-berry, **Rubus spectabilis** and **R. parviflorus.** It has been noted only sparsely on poplars and willows. It does not seem to attack conifers, rhododendrons, hollies, elders or acacias.

The chief injury caused in the present outbreak in Vancouver has been to the horse-chestnuts and maples on the boulewards, and to the vine maples in Stanley Park. These latter suffered severely in 1924, numerous dead limbs being seen as the result of the immense number of scales on the young branches.

In addition to the above there is the previously mentioned drip which caused so many complaints and so much enquiry.

Control Measures

This species of Lecanium is one more example of an insect, introduced into a new environment, unaccompanied by any parasites and their consequent controlling influence, becoming a greater pest in its new home than in its old one. In Europe, it is not a pest of major importance; but in Vancouver, in the two years that it has been under observation, no natural control forces whatever have been noticed. Artificial control measures therefore have had to be resorted to.

In the case of this insect, which infests such large trees as the broad-leaved maple, growing to a height of 90 to 100 feet, the first difficulty in control was adequate machinery to reach the tops of these trees, and a 25 h.p. solid stream spray pump, similar to those used for gipsy moth and elm beetle control in the eastern States, was obtained.

Two proprietory oil emulsions were used at 8, 10 and 12½ per cent. strengths, and both were effective at these dilutions. A small area was also sprayed with the emulsion at a 5% dilution, but only about a 40% kill was obtained. Well over 90% control was effected by the stronger emulsions.

The spray was applied in December and during February and March, up to the time that the buds were bursting. No difference was noticed in effectiveness between these two times of application. The end of March in an average year is practically the latest date when a dormant strength oil spray can be safely used.

Certain oil emulsions were used on the evergreen laurels without any injury resulting.

On the boulevard trees, an average of four to six gallons of spray was used per tree. The chief difficulty experienced with the solid stream nozzles, which were necessary to reach the taller trees, was in covering completely without undue waste or harmful amounts of oil running down the trunks.

Several acres of vine maples in Stanley Park which were sprayed both in 1924 and 1925 with oil show no damage from its use, and in fact have improved greatly in health since the scale was eliminated.

Experiments were conducted with a summer spray, using nicotine sulphate and whale oil soap at standard strength.

This was quite effective in killing the newly hatched scales, and should be applied during the first week in September. If applied earlier, some of the young scales will be missed, as all the eggs have not hatched before that date.

There is no doubt but that this pest is here to stay and will from time to time cause trouble.

It has not spread very rapidly, but at present is found in West Vancouver and North Vancouver, as well as in Vancouver itself, where Stanley Park and the west end of the city are generally infested. There are also isolated infestations in the suburbs at Kitsilano, Fairview and Grandview. These districts are within a two-mile radius of the original infestation.

Owing to the impossibility of private people possessing adequate spray machinery to cope with this pest, it will always be a municipal control project.

THE POPLAR SAWFLY (Trichiocampus viminalis (Fallén))

By W. Downes

During the month of August the Lombardy poplars in all parts of the city of Victoria, B. C., have in recent years been defoliated by numbers of small yellow and black caterpillars, which later on would descend the tree trunks and swarm over nearby fences and buildings. At first this insect was thought to be a new species, and was described as such by

the late Dr. MacGillivray under the name of **Platycampus victoria** (1). Lately this sawfly has been shown by H. L. Viereck, Dominion Entomological Branch, to be identical with **Trichiocampus viminalis** (Fallén) (2), a European species. It has previously been recorded under this name as occurring in destructive numbers in the city of Toronto in 1915 (3). In the United States the insect was first recorded at Albany, New York, by Lintner (4) and described by him under the name **Aulacomerus lutescens**. It has also been recorded from New Haven, Connecticut (5). In British Columbia enquiry has failed to elicit any information as to its occurrence prior to the year 1915, and the first published notice of it occurs in the Provincial Museum Report for 1917, p. 9, where an unusually heavy infestation of this sawfly is mentioned. In British Columbia the species is at present confined to the southern portion of Vancouver Island and has been recorded as far as Duncan, forty miles north of Victoria.

Host Plants

According to Rohwer (5), the recorded host plants in America are Carolina poplar **(Populus deltoides)** and **Populus monilifera**. In Europe, according to the same authority, it has been recorded from **Populus monilifera, Populus pyramidalis, Populus alba, Populus dilatata** and **Salix caprea**. In British Columbia the principal food plant of the species is the Lombardy poplar **(Populus nigra italica)**, and it is occasionally taken on **Populus alba, Populus tremuloides**, and the native cottonwood **(Populus trichocarpa)**, isolated trees of which have been badly stripped.

When the insect occurs in destructive numbers, the host trees may be completely defoliated, and, besides the injury done to the trees, annoyance is caused by the larvae when migrating in search of suitable places in which to pupate. Normally they enter holes and crevices in the tree trunks or beneath clods and loose bark, and there spin a brown waxy cocoon; but when in large numbers, they make for the nearest building or fence and sometimes enter houses. In 1920 a row of Lombardy poplars at the rear of the Empress Hotel in Victoria, B. C., was completely stripped by them, and later on thousands of larvae crossed the asphalt paving and climbed the walls of the building. Here they were swept down daily by the gardeners and gathered up by the shovelful. In 1918 a severe attack of the sawfly occurred, all poplar trees in the city being stripped. Since then the attacks have been less general, the species having been reduced to small numbers by a bacterial disease.

Life-history.

The winter is spent in the pre-pupal stage within the cocoon. The pupal stage lasts about fourteen days. The adults begin to emerge during the last week of May and continue to appear until the latter part of July. I have records of emergence as follows: May 20th, 29th, 30th,

June 6th, 10th, 26th, 27th, 28th, July 8th, 20th. I have found no evidence that there are two generations in British Columbia, although, in New York, two have been found by Lintner (4).

Oviposition: The first eggs were found on June 22, but there is evidence that some are laid as early as the first week in June. The latest date when females were seen ovipositing was July 23. On this date a pair were seen **in coitu.** About this time the males congregate together, and on warm days frequent shady places where they fly swiftly backwards and forwards. By August 1 the adults of both sexes had disappeared. The eggs are inserted in the leaf petioles, from ten to fourteen eggs being laid in each stem. The female takes up her position on the upper side at the lower end of the petiole and makes a longitudinal slit slightly to one side of the axis, inserting the egg at the same time. The process of laying an egg takes several minutes, and, when so engaged, the flies are very tame, and sometimes the leaf could be picked off without disturbing them or causing them to cease ovipositing. When disturbed, they drop from the leaf a short distance before taking to flight. Usually the eggs are laid alternately on the right and left of the petiole, but often stems were found with egg punctures on one side only. Mature leaves were always chosen, the young leaves at the tip of the shoots being avoided. The egg is pure white, frequently irregularly shaped, surface smooth and glossy, cylindrical, slightly tapering to one end and often slightly curved, giving it a bean-shaped appearance. As incubation progresses, the eggs increase slightly in size and sometimes become partly exposed and visible within the punctures. Occasionally the eggs are not inserted very deeply in the petioles and then become partly forced out of the slits by the pressure of the stem tissues. The period of incubation was found to be from 20 to 23 days.

The larva. Young larvae were first found on July 5, but there is no doubt whatever that many are hatched before this, as a full-fed larva was found on the 23rd, and as the period of growth is from 35 to 40 days, this one must have hatched about June 20. When newly hatched, the young larva is translucent, yellowish-white in colour, except the jaws, which are brown, and two black spots in the centre of the epicranial lobes. The body is slightly hairy, the hairs arising from tubercles on the back and sides. The head also has a few short hairs. Within a few hours the head becomes jet black. The legs are transparent, the claws are reddish brown, the skin is smooth and shiny and the internal organs show through. On hatching, the young caterpillars crawl to the under side of the leaf and there rest for a short time prior to feeding. They congregate together on the leaf and commence feeding by eating away the surface of the leaf near the tip. Gradually they extend this area until the edge of the leaf is reached, when they begin to feed backwards towards the petiole, keeping close together with their heads towards the tip of the leaf. This habit of feeding in company is maintained through

Fig. 1. Poplar Sawfly larvae feeding.
Fig. 2. Poplar Sawfly larvae at rest on leaf.
(Original)

every instar, and although they frequently wander away to find fresh leaves, they subsequently come together again, larvae of different ages being often found together. During the first and second instars only the parenchyma is eaten away, but as they grow older the entire leaf substance is eaten, with the exception of the midrib.

After the first instar the colour of the larva deepens; and during the second instar the first tint of yellow is seen on segments 2, 3 and 11, the rest of the body being very pale green. Practically no change in colour occurs in later instars until the larva is full-fed, except that the yellow colour of the segments mentioned becomes more intense and the black spots along the sides, which make their appearance in the second instar, become larger and more distinct. But when the larva is full grown, a curious change in colour occurs. The yellow colour gradually deepens and spreads over the entire body, and instead of the larva appearing somewhat translucent it becomes opaque, with the exception of a line down the centre of the dorsum, marking the division between the fatty tissue on each side of the body. This change of colour takes place towards the close of the fifth instar and may comprise about four days. When the colour has changed to a deep yellow, the larva ceases to feed and then begins to wander away in search of a place in which to pupate, spining its cocoon very shortly afterward. Individuals commenced to turn yellow on Sept. 16, and on the 22nd two of these had commenced to spin up. There are five instars, and the average length of each instar was found to be seven days.

Method of study. It was found impossible to keep the larvae in confinement, partly owing to the fact that the poplar leaves could not be kept in a fresh condition even in water, but also because the young larvae cannot stand being moved to fresh food, especially in the earlier stages, and have difficulty in starting a fresh feeding place. When a colony has commenced feeding on a leaf they are accustomed to work backwards towards the petiole until the leaf is consumed, and, when young larvae are moved to fresh leaves, they appear confused and wander about looking for the familiar nibbled edge to which they are accustomed. Hunger forces them to nibble at the new leaves, and they attack the surface here and there in an aimless, irregular sort of way and before long apparently weaken and finally die, especially after they have been disturbed two or three times. Consequently it was found necessary to enclose colonies in cheesecloth bags on the trees, and the first lots of eggs were bagged on July 23 and at intervals thereafter. From time to time fresh colonies were enclosed since, owing to losses from disease, it was found necessary to secure more to keep up the necessary number for observation. The bags were examined daily and the moults were readily determined by the presence of cast skins in the bags. The appearance of a larva immediately after a moult is also distinctive, as the head does not harden for several hours, and, together with the rest of the body, is

translucent, pale yellowish-white, and the normal colour does not return until the larva recommences feeding.

Altogether, sixteen colonies were under observation from time to time. Of these, five were bagged in the egg stage, four from the commencement of the first instar, and the rest during later stages.

Average length of instars. 1st instar 7.5 days, 2nd instar 7 days, 3rd instar 6.8 days, 4th instar 7.7 days, 5th instar 11.2 days.

Pupation. The larvae do not necessarily enter the ground to pupate, but spaces and cracks under clods and stones may be utilized. They will enter crevices in the trunks of trees or under loose bark, working their way in as far as possible, or will crawl into the spaces between shingles on the sides of buildings. In captivity they will spin a cocoon in the corner of a tin, but always prefer to spin between two surfaces when possible. I have never known them to spin a cocoon in the leaves. The cocoon is brown, irregularly oval, thin, semi-transparent, about half an inch in length and composed of silk matted together with a gummy secretion which dries hard. The insect may remain in the pre-pupal condition for two years, as I bred three adults in 1919 from larvae that pupated in 1917. The larva normally remains in a pre-pupal condition within the cocoon all winter in a half-curled position and much diminished in size, and the pupal stage, which is quite short, does not occur until late spring or midsummer. Larvae collected in the fall and kept in outdoor cages commenced to pupate on June 19, and the first adult appeared on July 3. As the pupal stage approaches, the larva increases in size and swells. Two white lines make their appearance along each side of the body. In a week or ten days the skin splits on the dorsum and the pupa wriggles free and the larval skin is sloughed off. The pupal stage lasts a fortnight or longer, according to temperature, and the approach of the final stage is indicated by the darkening of the eyes and head, which gradually become entirely black. At the end of about a week the pupal membrane is cast off, and the perfect insect emerges after cutting a hole in the end of the cocoon.

Diseases and Natural Enemies

During the course of the investigation, it was found that the young larvae often died off very suddenly. This was particularly noticeable at the first when most of the larvae were small, and it was soon observed that they were being rapidly decimated by a bacterial disease. Many colonies died almost immediately after hatching; others contracted the disease at a later period, and up to the fourth instar there was much mortality. The diseased larvae were sometimes found shrunken and dry, adhering to the leaf surface by their prolegs with the thoracic segments bent backwards, but usually they fell to the ground, and as the season advanced great numbers of dead larvae could be seen beneath the trees. The disease seemed to be highly localized, as if it were dependent on some agent for its distribution. Its presence probably accounts for the fact of

the complete disappearance of the sawfly larvae from certain blocks of trees. It was noticed that in certain places in the city, where the trees have been completely defoliated, that the year following they would often be entirely free, and yet trees only two or three hundred yards away would be absolutely stripped. In certain seasons the larvae are well controlled by this disease, and in the year 1922 their numbers were kept down to a minimum in all parts of the city, being scarcely observable at all in some places where they were formerly abundant. According to Mr. G. F. White, of the United States Bureau of Entomology, who examined infected larvae forwarded by the Dominion Entomologist, this disease is allied to **Coccobacillus acridiorum** d'Herelle, and the symptoms of its attack are "not unlike those of similar diseases affecting other species. In these diseases a septicemia occurs which kills in a day or so. While this group of disorders is receiving considerable study, much is yet to be done in the solution of the problem, as it is quite complex."

Very few other natural enemies of the larvae have been observed. A single specimen of an ichneumon parasite was bred from a pupa, but none since, and this case is apparently exceptional. Syrphid larvae have been in several instances seen to attack them. Attempts to make coccinellid larvae eat them were a failure. Birds apparently will not touch the sawfly larvae owing to their acrid, unpleasant odour, which is quite perceptible at a distance of over one foot from colonies on the leaves. When offered to domestic poultry, the larvae were rejected. Not knowing what they were, the fowls seized them readily when first thrown on the ground, but dropped them at once with evident disgust, and could not be induced to pick them up a second time.

Control.

It was found that the larvae were readily controlled by spraying with arsenate of lead powder at the strength of one pound to 40 gallons of water. After three days it was found that all young larvae had been killed and most of the older larvae, a few of the latter only remaining on the leaves, and they were sickly and disappeared within the next few days. Stripping generally commences on the trees within twenty or twenty-five feet of the ground, and that leads me to infer that the flies do not rise very high to oviposit. It is quite noticeable in any season that the outbreak usually commences among the lower limbs, and the larvae gradually spread upwards as the food supply diminishes below. It would appear, therefore, that if taken in time, it would be only necessary to spray the lower parts of the trees to obtain satisfactory control.

(1) Can. Ent. LII. p. 61, 1920.
(2) Can. Ent. LVII. p. 43, 1925.
(3) Cosens, Rept. Ent. Soc. Ont. 1915, p. 15.
Caesar, Ibid. p. 33.
(4) Lintner, 4th Rep. Ins. N.Y. 1888, p. 44.
(5) Rohwer, Proc. U.S.N.M. LX, p. 8., 1922.

THE CONTROL OF THE OYSTERSHELL SCALE WITH OIL SPRAYS

BY M. H. RUHMANN

For many years a dormant application of Lime Sulphur (1-9) has been recommended for the control of the Oystershell Scale; in the Eastern Provinces this appears to give satisfactory results. It has been realized for some years that under the semi-arid conditions of the interior of British Columbia the dormant application of Lime Sulphur is ineffective in the control of this scale. Repeated tests have been made with Lime Sulphur 1-7, 1-8, and 1-9, also with the addition of 1 lb. of lye to each 80 gallons of the last two strengths, and in no instance were satisfactory results obtained.

Since 1915 a summer spray of Lime Sulphur 1-30, or Nicotine Sulphate 1-1200, or a combination of the two, has been recommended in the interior, the latter giving the most satisfactory results in the hands of the growers; these sprays must be applied as the eggs are hatching and necessitates close observation of the grower to ascertain the correct time of application, the hatching period varying considerably from year to year; according to our records this may occur at any time from May 28 to June 21. The results show that although many growers are successful in controlling the Oystershell scale, the majority fail to interpret the correct time of application, and obtain unsatisfactory results. In the month of March, 1921, Mr. E. P. Venables suggested to the writer the use of an oil spray for the control of the Oystershell Scale during the dormant season. Owing to the possibility of injury to fruit trees by oil sprays, Mr. Venables offered to place some of his own trees at our disposal for the experiment.

A fuel oil emulsion was decided upon and an emulsion was prepared, consisting of the proportions of 10 gallons of Fuel oil, 10 lbs. of Whale oil soap and 100 gallons of water; this spray was applied to a tree which was heavily infested with the scale; owing to unavoidable circumstances, this spray was not applied until after the buds were breaking, and severe injury was anticipated.

The fuel oil spray was applied with a small hand-pump, with which little pressure was obtainable; samples of the scales were examined from time to time, and it was found that all eggs were covered with a film of oil within a week after application of the oil spray; it was also noted that no injury had resulted to the buds from the late application of the spray.

The destruction of the eggs progressed slowly, but by the first of June it was found that all eggs had been destroyed, and the tree, which had been severely stunted by the heavy infestation of the scale, was putting on a vigorous growth. The results of this experiment were so successful that it was decided to arrange for a commercial test in the spring

of 1922. Arrangements were made with the Horticultural Branch, and Mr. H. H. Evans, Assistant District Horticulturist at Vernon, undertook to make the applications on a commercial scale. It was at the same time decided to test a new commercial miscible oil ("Dormoil"), manufactured by the Hood River Spray Co., which had been giving good results in the control of the Leaf roller in Oregon.

Permission was obtained from the owners of two city orchards to use their trees for these experiments. Both orchards were composed of trees 20 years old or over, and had, in each case, not borne any marketable fruit for a number of years owing to the severity of the scale infestation. These orchards were divided into three plots for the experiment. Plot 1 receiving an application of 10 per cent. Dormoil, and Plot 2 receiving an application of 10 per cent. Fuel Oil, plus whale oil soap in the proportion of 10 lbs. to each 100 gallons of spray. Plot 3 was used as a check.

Result:

Plot 1, Dormoil 10%. Six days after application all eggs examined were found to have been destroyed by the spray; the eggs were completely broken down by the action of the oil; at no period during later examinations were normal eggs found. The Dormoil caused a slight check in the development of the buds, but no injury was apparent; examinations were continued until July 12, and it was evident that, where perfect contact had been obtained with the spray, 100 per cent. control had been obtained.

Plot 2 received an application of 10 per cent. fuel oil, plus 10 lbs. of Whale Oil soap to each 100 gallons of spray. Six days after application all eggs examined were distinctly covered with a film of oil, normal aeration being thereby prevented. Frequent examinations until the hatching period (June 5, 1922) showed a gradual increase in the number of eggs killed, the killed eggs turning brown and did not collapse, as in the case of the Dormoil spray. Bud development was normal with this spray. At hatching time, 87 per cent. of the eggs had been killed. A final examination on July 12 revealed the following facts: Under 50 scales examined, 316 dead larvae were found; all eggs remaining had shrivelled up or turned brown. A terminal twig 16 inches long was found to have 863 scales attached (adult). The number of larvae which had escaped from these and were attached to the twig was 27. From the above facts this material might be considered a good commercial spray.

Plot 3. Check. On June 21, examination was made of branches from trees on the check plot; these were found to be heavily coated with young scales. Fifty adult scales were examined and the following observations made: One apparently normal egg was still present; 94 live larvae and 38 dead larvae were still under the old scales examined. It is quite evident from these observations that there is a slight mortality

under normal conditions; of the 94 live larvae still under the old scales, a considerable number would undoubtedly have succeeded in making their escape.

Both these sprays have given excellent control, and over the period of the experiments no injury was apparent to the trees; whether uniformity of standard can be maintained in these oils, whether regular applications can be made without injury to trees, or whether variations in climatic conditions at the time of their application will have any bearing on possible injury to trees can only be ascertained by continued experiments over a number of years.

NOTES ON SOME BRITISH COLUMBIA GRYLLOBLATTARIA DERMAPTERA AND ORTHOPETRA FOR THE YEAR 1925.

By E. R. Buckell.

During 1925 a few interesting captures have been made in Orthoptera and closely allied orders.

Order **GRYLLOBLATTARIA**

Grylloblatta campodeiformis E. M. Walker. 1914.

Walker, E. M. Can. Ent. vol. 46 p. 93 (1914).

This interesting species was found to be fairly common under damp logs and rocks at an elevation of 7,300 feet in the Selkirk Mountains near Invermere.

It is at home in cold, damp locations, and quickly dies when exposed to heat. Specimens taken from under logs at Banff, Alta., and at Invermere, and placed on the palm of the hand in direct sunlight, immediately showed signs of distress and died within 25 seconds.

Locality records. Invermere, 1925 (E. R. Buckell).

Order **DERMAPTERA**

Anisolabis maritima (Gené) 1832.
Gene. Ann. Sci. di Regno Lombardo. Veneto, Padova, vol 2. p. 215 (1832).

A small colony of these earwigs was found on May 24th, 1925, at Snake Island, Departure Bay, near Nanaimo, by Prof. G. J. Spencer. This is the first time that this European species has been recorded from the Pacific coast of North America. It has become firmly established at a number of localities on the Atlantic coast of the United States.

Locality records. Snake Is., Departure Bay. 1925 (Prof. G. J. Spencer).

Order **ORTHOPTERA**

Family **Acrididae**

Subfamily **Acridinae**

Bradynotes caurus Scudder. 1898.

Scudder, Samuel H., Proc. U. S. Nat. Mus. xx., pp. 81, 83. (1898).

This species was wrongly recorded as **Bradynotes pinguis** (Scudder) in the Proceedings of the B. C. Entomological Society, No. 21, p. 9, 1924.

Locality records. Rockcreek, 1922; Anarchist Mt., 1923 (E. R. Buckell).

Family **Tettigoniidae**

Subfamily **Rhaphidophorinae**

Pristoceuthophilus cercalis Caudell. 1916.

Caudell, A. N. Proc. U. S. Nat. Mus., vol. 49, p. 673 (1916).

An adult male of this species was taken on September 25th, 1925, in an old trapper's cabin near the headwaters of the Eagle River, about twenty miles north of Malakwa.

This is the first record of this species from Canada.

Locality records. Malakwa, 1925 (E. R. Buckell).

ADDITIONS TO THE LIST OF APHIDIDAE OF BRITISH COLUMBIA

R. Glendenning

In Number 21 of the Proceedings of the Entomological Society of British Columbia, a preliminary list of aphids found in British Columbia was published.

The following additions are the result of further study of material collected during the years 1921 to 1923, and the later collections of 1924 and 1925:

In the former list the authorities for the species were bracketed indiscriminately through a typographical error.

I wish to express thanks to Dr. E. M. Patch and Mr. W. A. Ross for assistance with certain difficult species.

Amphophora rubicola (Oest.) Taken on **Rubus parviflorus,** the native thimbleberry, Vancouver.

Aphis neilliae Oest. On **Physocarpus (Neillia) opulifolius,** ninebark, Harrison Lake. Summer host not known.

Aphis salicicola Thomas. From **Salix scouleriana,** Harrison Lake.

Aphis varians Patch. Fall migrants of this species were taken on the wild **Ribes divaricatum** at Agassiz, 1925.

Cavariella pastinacae (L). Collected from its primary hosts, various willows, and from its secondary hosts, various umbellifers.

Dilachnus curvipes Patch. One late individual caught on the wing near Agassiz, Sept., 1925. Probably from **Abies grandis.**

Liosomaphis berberidis (Kalt). Found on **Berberis vulgaris** on the Experimental Farm, Agassiz.

Macrosiphum californioum (Clark). On **Salix lasiandra** in spring, Agassiz. (M. laevigatae Essig.)

Macrosiphum crataegi (Monell). On English hawthorn. Stanley Park, Vancouver, in the spring.

Macrosiphum coryli Davis. On native hazel, **Corylus californica,** Agassiz.

Macrosiphum kaltenbachii Schout. On **Ribes lacustre,** Harrison Lake.

Myzocallis alnifoliae (Fitch). Very abundant on alder all over the Lower Fraser Valley in 1924. Not seen before or since. Leaves copiously blackened by the fungus Cladosporium sp: growing on the aphid honeydew.

Myzocallis coryli (Goeze). On European hazel, Agassiz, 1924.

Myzocallis ulmifolii (Monell). On American elm, Agassiz.

Pemphigus populimonilis Riley. Making a line of wart-like galls on the upper side of the leaves of **Populus trichocarpa.** Common every year.

Rhopalosiphum hippophaes Koch. This species was found on **Polygonum persicaria, knotweed,** where it curls the leaves into a tube and lives in company with a psyllid. Its occurrence at Agassiz is rather remarkable, as of its only recorded primary hosts, **Eleagnus and Hippophaes, Eleagnus** alone is native to British Columbia. but does not occur within many miles, being a dry-belt plant.

There are no plants of **Hippophaes** in the neighbourhood as far as I know. It must either migrate many miles every spring and fall or else have adopted itself to another primary host.

Tuberolachnus viminalis (Boyer). On **Salix sitchensis,** Harrison Lake. A large species very distinct from the prominent dorsal median tubercle.

LIST OF MEMBERS, 1925.

L. E. Marmont, Maillardville, B. C.....Lepidoptera
W. B. Anderson, 1225 Roslyn Road, Victoria, B. C.....Lepidoptera
W. R. Buckell, Salmon Arm, B. C.....Lepidoptera
E. Hearle, Court House, Vernon, B. C. .....Mosquitos
M. H. Ruhman, Court House, Vernon, B. C. .....Lepidoptera
E. R. Buckell, Court House, Vernon, B C.....Orthoptera
E. P. Venables, Court House, Vernon, B. C. .....Lepidoptera
E. H. Blackmore, P. O., Victoria, B. C.....Lepidoptera
W. H. Lyne, Court House, Vancouver, B. C. .....Imported Insects
R. Glendenning, Agassiz, B. C. .....Aphids
J. W. Gibson, Dept. of Education, Victoria, B. C.
O. Whittaker, Chilliwack, B. C. .....Hemiptera
W. E. Ward, C. P. R. Freight Office, Vancouver.
T. A. Moillet, Vavenby, B. C.
W. H. Robertson, Dept. of Agriculture, Victoria, B. C.
C. Garret, Cranbrook, B. C. .....Diptera and Hymenoptera
F. C. Whitehouse, Nelson, B. C. .....Odonata
A. W. Hanham, Duncan, B. C.....Lepidoptera and Coleoptera
R. Hopping, Court House, Vernon, B. C. .....Coleoptera
G. O. Day, Duncan, B. C. .....Lepidoptera
F. Kermode, Prov. Museum, Victoria
J. Davidson, University of B. C., Vancouver.
J. W. Winson, Huntingdon, B. C.
K. F. Auden, c/o University of B. C., Vancouver.....Coleoptera
W. Downes, Dept. of Agriculture, Victoria, B. C.....Hemiptera
R. S. Sherman, 3642 Dundas St., Vancouver, B. C.....Diptera
P. N. Vroom, University of B. C., Vancouver.
A. P. MacDougall (Miss) University of B. C., Vancouver, B. C.....Aphids
C. Bannister, 1154 Robson St., Vancouver, B. C.
G. E. W. Clarke, Court House, Vancouver, B. C.
J. Stanley, 3380 Victoria St., New Westminster.
G. J. Spencer, University of B. C., Vancouver.
P. W. McLeod. 853 Hamilton St., Vancouver.
S. Hincke. 534 Cambie St., Vancouver
G. A. Hardy, Provincial Museum, Victoria.....Coleoptera